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**1 [High dynamic range imaging](#)**

 Paul Debevec, Erik Reinhard, Greg Ward, Sumanta Pattanaik  
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes SIGGRAPH '04**

Publisher: ACM Press

Full text available:  pdf(20.22 MB)

Additional Information: [full citation](#), [abstract](#)

Current display devices can display only a limited range of contrast and colors, which is one of the reasons that most image acquisition, processing, and display techniques use no more than eight channel. This course outlines recent advances in high-dynamic-range imaging, from capture to remove this restriction, thereby enabling images to represent the color gamut and dynamic range of the original scene rather than the limited subspace imposed by current monitor ...

**2 [Facial modeling and animation](#)**

 Jörg Haber, Demetri Terzopoulos  
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes SIGGRAPH '04**

Publisher: ACM Press

Full text available:  pdf(18.15 MB)

Additional Information: [full citation](#), [abstract](#)

In this course we present an overview of the concepts and current techniques in facial modeling and animation. We introduce this research area by its history and applications. As a necessary prerequisite for facial modeling, data acquisition is discussed in detail. We describe basic concepts of facial animation and present different approaches including parametric models, performance-, physics-, and learning methods. State-of-the-art techniques such as muscle-based facial animation, mass-s ...

**3 [Projectors: advanced graphics and vision techniques](#)**

 Ramesh Raskar  
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes SIGGRAPH '04**

Publisher: ACM Press

Full text available:  pdf(6.53 MB)

Additional Information: [full citation](#)

**4 [Real-time shading](#)**

 Marc Olano, Kurt Akeley, John C. Hart, Wolfgang Heidrich, Michael McCool, Jason L. Mitchell, Randi August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes SIGGRAPH '04**

Publisher: ACM Press

Full text available:  pdf(7.39 MB)

Additional Information: [full citation](#), [abstract](#)

Real-time procedural shading was once seen as a distant dream. When the first version of this course was offered four years ago, real-time shading was possible, but only with one-of-a-kind hardware or the effects of tens to hundreds of rendering passes. Today, almost every new computer comes with hardware capable of interactively executing shaders of thousands to tens of thousands of instructions. This course has been redesigned to address today's real-time shading capabilities ...

## **5 Level set and PDE methods for computer graphics**

 David Breen, Ron Fedkiw, Ken Museth, Stanley Osher, Guillermo Sapiro, Ross Whitaker  
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes SIGGRAPH '04**

**Publisher:** ACM Press

Full text available:  pdf(17.07 MB)

Additional Information: [full citation](#), [abstract](#), [citations](#)

Level set methods, an important class of partial differential equation (PDE) methods, define surfaces implicitly as the level set (iso-surface) of a sampled, evolving nD function. The course begins with material that introduces the concept of using partial differential equations to solve problems in computer graphics, geometric modeling and computer vision. This will include the structure and behavior of different types of differential equations, e.g. the level set eq ...

## **6 Point-based computer graphics**

 Marc Alexa, Markus Gross, Mark Pauly, Hanspeter Pfister, Marc Stamminger, Matthias Zwicker  
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes SIGGRAPH '04**

**Publisher:** ACM Press

Full text available:  pdf(8.94 MB)

Additional Information: [full citation](#), [abstract](#), [citations](#)

This course introduces points as a powerful and versatile graphics primitive. Speakers present their concepts for the acquisition, representation, modeling, processing, and rendering of point samples along with applications and research directions. We describe algorithms and discuss current problems and limitations, covering important aspects of point based graphics.

## **7 The elements of nature: interactive and realistic techniques**

 Oliver Deussen, David S. Ebert, Ron Fedkiw, F. Kenton Musgrave, Przemyslaw Prusinkiewicz, Doug I. Stamm, Jerry Tessendorf  
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes SIGGRAPH '04**

**Publisher:** ACM Press

Full text available:  pdf(17.65 MB)

Additional Information: [full citation](#), [abstract](#)

This updated course on simulating natural phenomena will cover the latest research and production techniques for simulating most of the elements of nature. The presenters will provide movie production, interactive simulation, and research perspectives on the difficult task of photorealistic modeling, rendering, and animation of natural phenomena. The course offers a nice balance of the latest interactive graphics hardware, simulation techniques and the latest physics-based simulation techniques ...

## **8 Recovering photometric properties of architectural scenes from photographs**

 Yizhou Yu, Jitendra Malik  
July 1998 **Proceedings of the 25th annual conference on Computer graphics and interactive techniques**

**Publisher:** ACM Press

Full text available:  pdf(367.09 KB)

Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

**Keywords:** BRDG, illumination, image-based rendering, photometric properties, photometric surface, reflectance, sky model

## **9 Computer graphics: introduction**

 Adam Lake  
May 1997 **Crossroads**, Volume 3 Issue 4

Publisher: ACM Press

Full text available:  [html\(41.28 KB\)](#) Additional Information: [full citation](#), [references](#), [index terms](#)

**10 GPGPU: general purpose computation on graphics hardware**

 David Luebke, Mark Harris, Jens Krüger, Tim Purcell, Naga Govindaraju, Ian Buck, Cliff Woolley, August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes SIGGRAPH '04**

Publisher: ACM Press

Full text available:  [pdf\(63.03 MB\)](#) Additional Information: [full citation](#), [abstract](#)

The graphics processor (GPU) on today's commodity video cards has evolved into an extremely flexible processor. The latest graphics architectures provide tremendous memory bandwidth and computational horsepower, with fully programmable vertex and pixel processing units that support operations up to full IEEE floating point precision. High level languages have emerged for graph making this computational power accessible. Architecturally, GPUs are highly parallel systems ...

**11 LightKit: A lighting system for effective visualization**

Michael Halle, Jeanette Meng

October 2003 **Proceedings of the 14th IEEE Visualization 2003 (VIS'03) VIS '03**

Publisher: IEEE Computer Society

Full text available:  [pdf\(633.08 KB\)](#) Additional Information: [full citation](#), [abstract](#)

LightKit is a system for lighting three-dimensional synthetic scenes. LightKit simplifies the task of visually pleasing, easily interpretable images for visualization while making it harder to produce the scene illumination distracts from the visualization process. LightKit is based on lighting designs by artists and photographers and shown in previous studies to enhance shape perception. A key feature is natural overhead illumination of the scene, augmented ...

**Keywords:** Visualization, lighting design, light color

**12 State of the art in Monte Carlo global illumination**

 Philip Dutré, Henrik Wann Jensen, Jim Arvo, Kavita Bala, Philippe Bekaert, Steve Marschner, Matt Icks, August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes SIGGRAPH '04**

Publisher: ACM Press

Full text available:  [pdf\(5.48 MB\)](#) Additional Information: [full citation](#), [abstract](#)

Realistic image synthesis is increasingly important in areas such as entertainment (movies, special effects), design, architecture and more. A common trend in all these areas is the quest for more realistic images of increasingly complex models. Monte Carlo global illumination algorithms are the only ones that can handle this complexity. Recent advances in algorithms and computer power has made Monte Carlo algorithms very practical and a natural choice for most problems. The purpose of this paper is to ...

**13 A signal-processing framework for inverse rendering**

 Ravi Ramamoorthi, Pat Hanrahan  
August 2001 **Proceedings of the 28th annual conference on Computer graphics and interactive techniques**

Publisher: ACM Press

Full text available:  [pdf\(1.01 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Realism in computer-generated images requires accurate input models for lighting, textures and materials. One of the best ways of obtaining high-quality data is through measurements of scene attributes from photographs by *inverse rendering*. However, inverse rendering methods have been largely limited by the lack of highly controlled lighting. One of the reasons for this is the lack of a coherent mathematical framework ...

for inverse rendering under general illumination conditions. Our ...

**Keywords:** BRDF, illumination, inverse rendering, irradiance, light field, radiance, signal processing, harmonics

**14 Real-time volume graphics**

 Klaus Engel, Markus Hadwiger, Joe M. Kniss, Aaron E. Lefohn, Christof Rezk Salama, Daniel Weiskopf  
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes SIGGRAPH '04**

**Publisher:** ACM Press

Full text available:  pdf(7.63 MB)

Additional Information: [full citation](#), [abstract](#)

The tremendous evolution of programmable graphics hardware has made high-quality real-time graphics a reality. In addition to the traditional application of rendering volume data in scientific visualization, the interest in applying these techniques for real-time rendering of atmospheric phenomena and media such as fire, smoke, and clouds is growing rapidly. This course covers both applications in visualization, e.g., medical volume data, and real-time rendering, ...

**15 Hue-balls and lit-tensors for direct volume rendering of diffusion tensor fields**

Gordon Kindlmann, David Weinstein

October 1999 **Proceedings of the conference on Visualization '99: celebrating ten years**

**Publisher:** IEEE Computer Society Press

Full text available:  pdf(2.26 MB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

With the development of magnetic resonance imaging techniques for acquiring diffusion tensor fields of biological tissue, visualization of tensor data has become a new research focus. The diffusion tensor describes the directional dependence of water molecules' diffusion and can be represented by a three-by-three symmetric matrix. Visualization of second-order tensor fields is difficult because the data values have nine degrees of freedom. Existing visualization techniques are best at portr ...

**16 Precomputed transfer: Real-time BRDF editing in complex lighting**

 Aner Ben-Artzi, Ryan Overbeck, Ravi Ramamoorthi  
July 2006 **ACM Transactions on Graphics (TOG)**, Volume 25 Issue 3

**Publisher:** ACM Press

Full text available:  pdf(1.03 MB)

Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Current systems for editing BRDFs typically allow users to adjust analytic parameters while visualizing results in a simplified setting (e.g. unshadowed point light). This paper describes a real-time rendering system that enables interactive edits of BRDFs, as rendered in their final placement on objects in a static scene under direct, complex illumination. All-frequency effects (ranging from near-mirror reflections and highlights to diffuse shading and soft shadows) are rendered using a ...

**17 Model-based object recognition in dense-range images—a review**

 Farshid Arman, J. K. Aggarwal  
March 1993 **ACM Computing Surveys (CSUR)**, Volume 25 Issue 1

**Publisher:** ACM Press

Full text available:  pdf(3.42 MB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

The goal in computer vision systems is to analyze data collected from the environment and derive an interpretation to complete a specified task. Vision system tasks may be divided into data acquisition, feature extraction, representation, model construction, and matching subtasks. This paper presents a comprehensive survey of model-based vision systems using dense-range images. A comprehensive survey of the publications in each subtask pertaining to dense-range image object recognition is provided.

**Keywords:** 3D object recognition, 3D representations, CAD-based vision, dense-range images, object understanding

**18 Session II: Programming graphics processors functionally**

 Conal Elliott

September 2004 **Proceedings of the 2004 ACM SIGPLAN workshop on Haskell Haskell '04**

**Publisher:** ACM Press

Full text available:  pdf(673.50 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Graphics cards for personal computers have recently undergone a radical transformation from fixed-function pipelines to multi-processor, programmable architectures. Multi-processor architecture is advantageous for graphics for the simple reason that graphics computations are naturally concurrent and well suited to stateless stream processing. They therefore parallelize easily and need no random access to memory with its problematic latencies. This paper presents *Vertigo*, a ...

**Keywords:** 3D modeling, code generation, compilers, computer algebra, computer graphics, distributed systems, functional geometry, functional programming, graphics languages, graphics processing, image evaluation, procedural geometry, procedural shading, shading languages

**19 Visualization: Enhancing interactive particle visualization with advanced shading models**

 Christiaan P. Gribble, Steven G. Parker

July 2006 **Proceedings of the 3rd symposium on Applied perception in graphics and visualization APGV '06**

**Publisher:** ACM Press

Full text available:  pdf(600.74 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Particle-based simulation methods are used to model a wide range of complex phenomena and their dependent problems of various scales. Effective visualization of the resulting state should communicate changes in the three-dimensional structure, spatial organization, and qualitative trends within a scene as it evolves. We take steps toward understanding and using advanced shading models in the context of interactive particle visualization. Specifically, the impact of ambient occlusion on ...

**Keywords:** ambient occlusion, diffuse interreflection, local shading, particle visualization

**20 Technical session 8: compression, streaming, and retrieval of 3D objects: Optimized mesh and texture multiplexing for progressive textured model transmission**

 Sheng Yang, Chao-Hua Lee, C.-C. Jay Kuo

October 2004 **Proceedings of the 12th annual ACM international conference on Multimedia**

**Publisher:** ACM Press

Full text available:  pdf(2.55 MB)

Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

An optimized scheme of multiplexing coded mesh and texture data to facilitate progressive transmission of 3D textured models is proposed in this work. The mesh and texture data of a 3D textured model are processed by respective compression modules and represented by a series of levels of details. Then, for a given rate-distortion surface can be generated based on the multiplexing of mesh and texture data in a progressive manner. The distortion is calculated by measuring the visual quality of the reconstructed model ...

**Keywords:** mesh-texture multiplexing, progressive transmission, rate-distortion surface

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